OUR COMMON FUTURE UNDER CLIMATE CHANGE

International Scientific Conference

ABSTRACT BOOK

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This Abstract book is based on a compilation of all abstracts selected for oral and poster presentations, as of 15 May 2015.

Due to the inability of some authors to attend, some of those works will therefore not be presented during the conference.

OUR COMMON FUTURE UNDER CLIMATE CHANGE

Welcome to the Conference

Welcome to Paris, welcome to 'Our Common Future under Climate Change'!

On behalf of the High Level Board, the Organizing Committee and the Scientific Committee, it is our pleasure to welcome you to Paris to the largest forum for the scientific community to come together ahead of COP21, hosted by France in December 2015 ("Paris Climat 2015").

Building on the results of the IPCC 5th Assessment Report (AR5), this four-day conference will address key issues concerning climate change in the broader context of global change. It will offer an opportunity to discuss solutions for both mitigation and adaptation issues. The Conference also aims to contribute to a science-society dialogue, notably thanks to specific sessions with stakeholders during the event and through nearly 80 accredited side events taking place all around the world from June 1st to July 15th.

When putting together this event over the past months, we were greatly encouraged by the huge interest from the global scientific community, with more than 400 parallel sessions and 2200 abstracts submitted, eventually leading to the organization of 140 parallel sessions.

Strong support was also received from many public French, European and international institutions and organizations, allowing us to invite many keynote speakers and fund the participation of more than 120 young researchers from developing countries. Let us warmly thank all those who made this possible.

The International Scientific Committee deserves warm thanks for designing plenary and large parallel sessions as well as supervising the call for contributions and the call for sessions, as well as the merging process of more than 400 parallel sessions into 140 parallel sessions. The Organizing Committee did its best to ensure that the overall organization for the conference was relevant to the objectives and scope. The High Level Board raised the funds, engaged the scientific community to contribute and accredited side events. The Conference Secretariat worked hard to make this event happening. The Communication Advisory Board was instrumental in launching and framing our communication activities on different media. We are very grateful to all.

We very much hope that you will enjoy your stay in Paris and benefit from exciting scientific

interactions, contributing to the future scientific agenda. We also hope that the conference will facilitate, encourage and develop connections between scientists and stakeholders, allowing to draw new avenues in the research agenda engaging the scientific community to elaborate, asses and monitor solutions to tackle climate change together with other major global challenges, including sustainable development goals.

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to get benefit from the adaptation fund while there are some households/communities are excluded from the groups. Also, limitation on extraction of forest products is in some instances undermining the livelihoods strategies of the forest dependant people limiting their adaptation capacity. There are also issues of resource access with members in particular can be constrained by poorly aligned jurisdiction.

The finding shows that the programme promotes entry points for pro-poor mitigation strategies. The growing stock of forest particularly in hills increased and the community forestry user groups have established resource distribution system based on wealth ranking of the groups, the mitigation strategies specifically the REDD mechanism may benefit to the poor category of the users. However, we find that the executive committees of CFUGs are politicized and the political ideology affects resource distribution. Also, there are high value forest trees, the illegal sale of which offers considerable financial intensives. So, particularly in the Terai, the conservation and management of forest may be competing with very high opportunity costs. Also, there are significant issues of land tenure conflicts between people and Government, VDCs (Village Development Committee), and communities, the result of which does not favor the protection, management and conservation of forest.

The findings suggest that CBCCA approach needs to integrate in rural development policies at landscape level. As the groups are growing as a local adaption funding institutions, the role of CFUGs should be linked with sources of credit and low-interest loans. To increase the community forest for mitigation, climate change sensitive forest management guidelines needs to developed and linked with national forestry activities. In addition, there is value in exploring PES (Payment for environmental services) and carbon markets more broadly than strictly REDD mechanism; Community forestry stakeholders should undertake experiential marketing of forest carbon in a volunteer market.

P-2216-02

Disentangling the climate change contributions of CO2 emissions from global forest bioenergy

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Many future energy and emission scenarios envisage an increase of bioenergy production in the global primary energy mix [1]. Bioenergy is the most important renewable energy option in studies designed to align with future RCP projections, reaching approximately 250 EJ/yr in RCP2.6, 145 EJ/yr in RCP4.5 and 180 EJ/yr in RCP8.5 by the end of the 21st century. However, many questions enveloping the direct carbon cycle and climate response to bioenergy systems remain open and partially unexplored. While the climate change effects of the different greenhouse gases (GHGs) are usually aggregated into common units (e.g., radiative forcing, CO2-equivalents, or °C), for example using emission metrics like the well-known global warming potential (GWP) or Global Temperature change Potential (GTP) [2], emission metrics for CO2 from forest bioenergy are not implemented in global emission scenarios. Bioenergy systems are largely assessed under the default climate neutrality assumption and the time lag between CO2 emissions from biomass combustion and CO2 uptake by vegetation is usually ignored, with integrated assessment models and policy directives mainly focused on the quantification and mitigation of the risks associated with deforestation and land use changes. Whereas recent studies show that the temperature change of CO2 emissions from re-growing biomass is characterized by an initial warming followed by a smaller long term cooling [3], an analysis that disentangles the role of CO2 emissions from bioenergy with a global coverage and within the policy relevant framework linking temperature peak and emissions is still missing [4]. Here, the characteristics of the climate system response to CO2 emissions from forest bioenergy is investigated within the 2 °C target and global spatially explicit maps of emission metrics for the climate impact characterization of CO2 emissions from forest bioenergy are produced. These metrics can be used to unravel the contributions to climate change of CO2 emissions from forest bioenergy, as here exemplified by assessing these emissions under the RCP8.5 scenario. The metrics are correlated with the site-specific turnover times and local climate variables and the characterized results are sensitive to the specific metrics used that inform about different dimensions of the climate system response to forest bioenergy. The temperature peak from bioenergy CO2 emissions is proportional to the maximum rate at which emissions occur and is nearly insensitive to the amount of cumulative emissions. While the transient climate response to cumulative emissions (TCRE) of CO2 from fossil fuels is approximately constant, the TCRE to bioenergy emissions depends on time, biomass turnover times, and emission scenarios. The linearity between temperature peak and bioenergy CO2 emission rates thus resembles the response to short-lived climate forcers. As for the latter, the timing of CO2 emissions from bioenergy matters. Under the international agreement to limit global warming to 2 °C by 2100, early emissions from bioenergy have smaller contributions on the targeted temperature than emissions postponed later into the future. The application of these metrics to CO2 emissions from forest bioenergy in the RCP8.5 scenario shows that emissions in 2015 cause a warming effect that is about 45% (expected range: 38-60%) of the gross emission flows when GWPs are used. On the other hand, the result in 2100 is a net climate cooling if GTPs are applied. A temperature peak about 35% (12-46%) less than that caused by an equal amount of emissions from fossil fuels is found. Without coupling the analysis with global climate models, CO2 emissions from forest bioenergy can thus be assessed under different climate change indicators and across various spatial and temporal scales using the global maps presented in this study.

[1] Van Vuuren DP, Elie Bellevrat, Kitous A, & Isaac M (2010) The Energy Journal 31:193-221; [2] Myhre G, et al. (2013) Anthropogenic and Natural Radiative Forcing. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the IPCC eds Stocker TF, et al.; [3] Cherubini F, Bright RM, & Strømman AH (2012) Environmental Research Letters 8(1): 014049; [4] Cherubini F, Gasser T, Bright RM, Ciais P, & Stromman AH (2014) Nature Clim. Change 4:983-987.

P-2216-03

A bioeconomic modelling of logged tropical forests to simulate low-carbon strategies for Central African concessions

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Among the contributions expected from forest sectors in policies of climate mitigation, one consists in increasing forest carbon stocks by changing management practices. This activity, generally referred to as Improved Forest Management (IFM), is of major importance in the Congo Basin forests, where 20 millions of hectares are now managed for timber production. The carbon benefit generated by IFM activities is often obtained by a reduction of harvesting pressures on forest resources. In the case of Extension of Rotation Age/Cutting Cycle (ERA) projects, the reduction of emissions comes from the increase of Minimum Cutting Diameters (MCD) and/or the extension of Felling Cycle Duration (FCD). However, such activities have negative consequences for the profitability of timber companies. Climate instruments such as the mechanism of Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+) promote a compensatory approach to cover these income losses by the valuation of avoided carbon emissions.

To determine the feasibility of such a carbon-based compensation, it is necessary to predict over the long term both the dynamics of forest carbon and the time schedule of timber incomes. The two are closely interrelated. Selective logging can alter the structure, the floristic composition, and thus, the carbon stocks of tropical forests. Modelling these forest-logging relationships is challenging. Selective logging implies to deploy a species level representation of timber harvesting but the high diversity of tropical forests, in pair with the scarcity of data, hinders the correct fitting of species-specific models.

We developed a bioeconomic approach coupling a mixture of inhomogeneous matrix models for forest dynamics and an object-oriented model for forest logging companies' operations. For forest dynamics, our methodology addresses the challenge of taking into account the high species richness by simultaneously clustering tree species into groups according to vital rate information and selecting group-specific explicative environmental variables. For the logging operations, the object-oriented approach allows us to precisely describe harvest choices under technical and economic constraints, in a highly configurable manner. In the case of a Central African forest concession managed by a typical sawnwood export-oriented company, we predicted the carbon stock evolution for a wide range of ERA scenarios and for a time scale of 100 years. For several categories of carbon credit, we calculated break-even prices that would enable carbon revenues to compensate logger's loss of timber incomes.

Our simulations are based on data from the M'Baïki site, in the Central African Republic (CAR), which has been monitored for 30 years through a collaborative partnership with various French and CAR institutional and research organizations. Economic data are taken from several forest concessionaires in Central Africa. We predicted that without any logging, carbon stock would increase naturally. When logging was simulated, the carbon stock decreased during the first felling cycle and although carbon recovery could be boosted by logging, this decrease was too sharp to catch up with unlogged levels. To ensure low break-even prices of carbon credits, ERA activities had to involve both FCD and MCD. In this case, we found a little dependence of the private discount rate and the alternative MCD and FCD, but a strong dependence of the way how carbon credits are accounted. Thus, from the perspective of the forest concessionaire, depending of the chosen type of credits, carbon revenues could compensate timber revenues for a large number of ERA projects.

We focused on IFM projects, but our approach remains appropriate for other strategies of forest sustainability improvement such as Reduced Impact Logging techniques or post-logging silvicultural systems. In the current context of REDD+ deployment, our work is a first step to bring some preliminary answers to the question of carbon-based compensation opportunities for industrial forest concessions in Central Africa, on the basis of an accurate modelling of tropical forestry.

P-2216-04

Dynamics of vegetation in Managed forest: the case of Missirah Forest in Senegal

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In the global climate change discussion, forest management has become a major concern because of the significant role of forest in climate change as both pool and source of carbon dioxide. Climate change discussion points out the important role of forest sector in climate change mitigation leading to mechanisms like Clean Development Mechanism (CDM) and Reducing Emissions from Deforestation and Forest Degradation (REDD). The concept of REDD launched in the 11th Conference of the Parties in 2005 became later REDD+ integrating sustainable forest management, forest conservation, and carbon sink enhancement. In Africa, there are only few operational REED+ programs but, the idea behind the concept is not new in African forest sector. There have been many attempts to tackle the issue of deforestation in Africa and in these attempts; agriculture, urban growth and wood extraction were identified as the main drivers. In Senegal the driving factors of deforestation derived from the literature are mostly the same. Nevertheless some factors are more specific to some areas. In the southern part of Senegal namely in Tambacounda and Kolda which are the main charcoal supply areas of the country, deforestation is correlated to wood extraction mainly charcoal production. Charcoal production contributes for more than 30% in deforestation in Senegal. To curb deforestation due to charcoal production, some forests were specifically managed for charcoal production under management plans where rules are set to make the production sustainable. Past studies related to forest management in Senegal focused mainly on the decentralization of forest management process, the effect of the institutional pluralism on the decentralization and the management of forest resources, the function of the forest management plan in the new Senegalese Forest code, the evolution of forest management in Senegal, and the effects of charcoal production on woodland regeneration. However there is a lack of relevant information on the dynamic of vegetation in managed forest comparing vegetation state baseline to the situation after a full rotation period. This information are relevant in the light of the willingness to expand the process in a large number of forests. Therefore this study aims at assessing the dynamic of vegetation in Missirah Forest. Specifically it consists of characterizing vegetation type state in 2013, determining their dynamic through the mapping of the land cover land use types from1990 to 2014, and determining vegetation dynamics in terms of floristic composition and dendrometric parameters between 2002 and 2013

Missirah Forest is one the first 3 managed forests for charcoal production in 2004. A mapping of the land use-land cover types was combined with a tree inventory to characterize the current status of the vegetation in 2013 and its dynamics between 2002 and 2013 using 94 circular plots in table lands and 57circular plots in gallery forest. The mapping of the LULC identifies 6 vegetation types namely tree savannah, shrub savannah, degraded shrub savannah, gallery forest, farmland, and settlement areas. It reveals a decrease of area covered by vegetation at the expense of cropland and the appearance of a new vegetation type resulting from the degradation of the other vegetation type. The result of the tree inventory reveals that the vegetation types and the farmland shelter a total of 54 species belonging to 18 families and 42 genera. Inventory data were analyzed according to land use land cover types. Mean diameter at breast height (dbh), tree density, stem density, mean Lorel height and mean basal area in the different land-use land cover were greater in gallery forest. These dendrometric parameters were also found to be significantly different among vegetation types ($p<0.05$) in 2013. The analysis of variance(ANOVA) conducted on the negative binomial model shows that between 2002 and 2013 from a vegetation type to another the difference in terms of diversity is highly significant ($p<0.05$) while from a year to another it is not significant ($p>0.05$). The K-mean method applied to the IVI of species identifies three classes defining species with increased, decreased, and relative stability IVI. Dendrometric parameters show greater values in 2002 except for stem density in tree savannah. Significant difference was observed for tree density, basal area, and mean Lorey height between 2002 and 2013.

P-2216-05

Population growth and deforestation in the Lake Albert region (Uganda) at the start of oil production

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In the early colonial days, a deep political and demographic crisis hit the eastern shores of Lake Albert, Uganda (Doyle). Large areas were then set aside as forest and game reserves. Later on migratory policies and practices shifted and the area became a land frontier. Migrant settlement was encouraged by government from the 1950s onwards. New settlements were promoted by the Ugandan State in response to international refugee crises, as well as national demand for land. Land patronage led to repeated encroachments on protected areas and severe deforestation. Since the 1990s, both the institutional role of central government, acting through a variety of bodies (the administration, the army, the forestry and wildlife services, etc.), and political patronage have consolidated Museveni's regime in somewhat contradictory ways. These contradictions shape access to land and natural resources locally at the start of a new oil frontier. Through a detailed mapping of population densities and growth and an analysis of qualitative interviews conducted in 2012-2014 in a collaborative research framework (M-PRAM, CPAS - IRD, Makerere University), we highlight increased vulnerability and inequalities as well as potential conflicts. Although climate variability is a factor of change locally, the short term issue shaping resource depletion is governance.